

## **Green Roof Development In New York City (NYC)**

Rabi Kieber  
Region 2 Green Building/Sustainability Coordinator  
Region 2  
(212) 637-4448  
kieber.rabi@epa.gov

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Like other urban greening efforts, green roofs can mitigate urban heat island effect, a serious concern in NYC, while providing much needed green space and rooftop gardens. NYC is 3.6 to 5.4 °F warmer than surrounding suburbs on summer afternoons, due in large part to the prevalence of dark rooftops that absorb and re-radiate sunlight. These higher temperatures lead to increased use of air-conditioning, requiring greater energy use and compounding patterns of resource depletion. A study by the Los Angeles-based Heat Island Group has found that rooftop-cooling efforts could lead to annual energy savings of \$16 million. A climate model developed through the U.S. Department of Energy revealed that increased reflective roof surfaces and urban re-vegetation could result in temperature reductions in NYC of 3.6° F.

Planted roofs are not only a natural source of environmental cooling, but also a method of reducing the negative effects of stormwater runoff. Stormwater runoff—which carries contaminants from paved surfaces and rooftops to our waterways—has been identified as a major source of water pollution. Green roofs can reduce these negative effects by absorbing up to 75% of rain that falls upon them. When rainwater flows off paved surfaces such as rooftops, parking lots and roadways, it picks up contaminants, including heavy metals. NYC relies on a combined sewage overflow (CSO) system to transport household sewage and runoff to its 14 sewage treatment facilities. During heavy rains, sewage treatment plants often cannot handle the increased volume of combined sewage and rainwater, causing an overflow which, untreated, empties into the city's waterways. There are 450 CSO locations in the five boroughs. Alleviating this problem, green roofs retain between 50-75% of stormwater, easing the pressure on the CSO system during heavy rain events.

At this point, green roofs have yet to be included as an implemented mitigation effort. But current research shows that these projects could significantly reduce air pollution in the city. On a green rooftop, a 1.0 m<sup>2</sup> plot of grass can remove 0.2 kg of airborne particulate from the air. Increasing the number of green rooftops could significantly reduce greenhouse gases, ozone, volatile organic compounds, and particulate matter that pollute NYC air.

EPA Region 2 is working in partnership with, among others, Earth Pledge, NYC Department of Environmental Protection, and several universities to demonstrate the efficacy of green roofs in controlling stormwater runoff, mitigating the effects of the urban heat island, and purifying the air. For the stormwater component, we are using the work done at Penn State and funded through a RARE grant, as an initial starting point for our more localized work.